

GE made carbon nanotube-based diode only 10 atoms wide, capable both to emit and detect light

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GE Global Research, the centralised research organisation of the General Electric Company, announced the development of the world's best performing diode built from a carbon nanotube, which will enable smaller and faster electronic devices with increased functionality. The nano-diode is one of the smallest functioning devices ever made.

The company announced its nanotechnology breakthrough as a cover story for "Applied Physics Letters." Unlike traditional diodes, GE's carbon nanotube device has the ability for multiple functions -- as a diode and two different types of transistors -- which should enable it to both emit and detect light.

"Just as silicon transistors replaced old vacuum tube technology and enabled the electronic age, carbon nanotube devices could open a new era of electronics," said Margaret Blohm, GE's advanced technology leader for nanotechnology. "We are excited about this breakthrough and we're eager to start developing new applications for the GE businesses."

GE's breakthrough device comes very close to the theoretical limits of performance. Measured through the ideal diode equation, developed by Nobel Laureate William Shockley, GE's new diode has an "ideality factor" very close to one, which is the best possible performance for a diode.

One possible application for GE is to use the device to build the next generation of advanced sensors that will have unsurpassed levels of sensitivity. For example, next generation sensors in security applications could detect potential terrorist threats from chemical and biological hazards, even if they are present in extremely small quantities. This would enable enhanced security at airports, office buildings and other public areas.

The carbon nanotube diode was developed by Dr. Ji-Ung Lee, a scientist who works in the Nanotechnology Advanced Technology Program at the GE Global Research Center in Niskayuna, N.Y. More research is underway to enhance the carbon nanotube diode and increase the yield in the manufacturing process, but GE nanotechnology researchers believe this breakthrough could enable a range of important new applications in computing, communications, power electronics, and sensors.

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